U.S. DEPARTMENT OF COMMERCE'S

IMPLEMENTATION PLAN FOR RECONSTRUCTION WORK IN CENTRAL AMERICA

PREPARED FOR:
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

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I. EXECUTIVE SUMMARY

As one of the leading U.S. government authorities on international trade and environmental protection and restoration, the Department of Commerce (DOC) will help Honduras, Nicaragua, El Salvador, and Guatemala rebuild their economies and improve their abilities to respond to and mitigate against hurricanes and other natural disasters. The Department's implementation plan, presented in this document, is comprised of assistance programs developed by three of its bureaus: the International Trade Administration (ITA), the National Institute of Standards and Technology (NIST), and the National Oceanic and Atmospheric Administration (NOAA).

GOALS AND OBJECTIVES

Consistent with its environmental and economic mandates, DOC's goal in assisting with the reconstruction of Central America is to support Central Americans' ability to make decisions that minimize their exposure to future disasters and promote sustainable uses of natural resources.

The Department's objectives are to provide key infrastructure elements, develop much-needed hydrometeorological predicting and warning systems, help promote more sustainable, resilient uses of coastal resources, help build local and regional capacity for coastal hazards mitigation, and encourage disaster-resilient economic revitalization.

DOC's implementation plan, by design, emphasizes training and capacity building to ensure the infrastructure and systems can be appropriately maintained once the implementation of the proposed work has been completed. DOC will adopt a consolidated approach to the training and capacity building outlined here and, wherever appropriate, will work closely with other U.S. government agencies engaged in similar activities to ensure continuity and the efficient use of resources.

PROPOSED PROJECTS

DOC's plan for work in the region includes projects in five areas: (1) Base Infrastructure Reconstruction; (2) Forecast and Warning Systems; (3) Disaster Preparedness and Response; (4) Sustainable, Resilient Coastal Communities; and (5) Economic Revitalization. Individual programs within each of these areas are outlined in the chart that follows.

Base Infrastructure Reconstruction

Reconstruct and Improve Geodetic Networks
Reconstruct and Improve Meteorological Data Collection Networks
Reconstruct and Improve Tide Gauge Networks
Develop Satellite Data Receiving, Processing, and Analysis Capability

Forecast and Early Warning Systems

Develop Country Strategic Implementation Plans
Reconstruct and Improve Flood Forecast Networks
Establish Flood Forecast System
Develop Regional Seasonal Climate Prediction System
Training and Capacity Building

Disaster Preparedness

Develop Approach for Regional Center for Disaster Reduction
Improve HAZMAT Spill Prevention and Response
Training and Capacity Building
Develop Reservoir Decision Support Framework

Sustainable, Resilient Coastal Communities

Supporting Sustainable Uses of Gulf of Fonseca Resources
Long-Term Weather Trends Analysis for Hazards Mitigation
Market Incentives for Resilient Construction
Resilient Building Codes/Construction Practices
Local Capacity Building and Support

Economic Revitalization

Trade Development

DOC Program Management

DOC's proposed activities will be performed within the required two-year time period. The programs outlined in this document, however, have been selected to provide the foundation for long-term, sustainable solutions to the problems identified. In addition, they support ongoing and planned national, U.S. government, and international efforts to respond to the destruction caused by Hurricane Mitch. In all of its work, DOC will actively seek to leverage the international donor community's resources, work closely with other U.S. government agencies participating in the reconstruction effort, and engage the private sector wherever feasible.

A number of the DOC projects require data from other U.S. government agencies. In addition, several projects proposed by other agencies complement or expand the scope of DOC's projects. To a great extent, DOC's ability to carry out its proposed activities effectively depends on access to these data and on close partnerships with the U.S. Geological Survey (USGS), the Department of Transportation (DOT), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (USACE), and the other agencies.

DOC has already taken steps to expand existing partnerships with other U.S. government agencies and build new relationships. For example, in April 1999 a DOC/NOAA technical team participated in a regional workshop on flood forecasting and disaster management in Honduras. There, the team worked with colleagues from the USGS and other U.S. government agencies to help develop a framework for forecast and early warning systems for the Central American countries represented at the workshop.

II. PROBLEM STATEMENT

The devastation caused by Hurricane Mitch dramatically brought to light a number of problem areas that need to be addressed in order for Nicaragua, Honduras, El Salvador, and Guatemala to recover from and mitigate against the effects of future, natural disasters. These problem areas can be grouped into five areas: (1) Base Infrastructure; (2) Forecast and Early Warning Systems; (3) Disaster Preparedness and Response; (4) Sustainable, Resilient Coastal Communities; and (5) Economic Revitalization.

BASE INFRASTRUCTURE

Hurricane Mitch destroyed much of the infrastructure in Central America, particularly in Honduras and Nicaragua, the two countries hardest hit by Mitch. Reconstruction and recovery of all the affected countries, however, depends to a large extent on the restoration and development of the following base infrastructure:

Geodetic Networks

A high-accuracy national geodetic network is the essential positioning framework for every nation. Without such a network, it is impossible to determine boundaries or land ownership, or to navigate and conduct other applications that require knowledge about position on the earth's surface. According to available information, the geodetic networks in both Honduras and Nicaragua were largely destroyed.

Hydrometeorological Data Collection Networks

Current information indicates that much of the existing hydrometeorological monitoring network of the affected countries was destroyed or is in a state of disrepair. This network of data collection platforms and telecommunications systems is essential for forecasting and early warnings of severe weather and other natural events, and is the foundation for any improvements to the region's forecasting and warning capabilities.

Tide Gauge Stations

Accurate sea level information is essential for the development of a precise geodetic control network, marine navigation, coastal surveying and mapping, coastal engineering, coastal zone management, storm surge and tsunami warning, and response to hazardous materials spills. Available information indicates that most water level stations in Honduras and Nicaragua were destroyed, and stations in other Central American nations are damaged or do not exist.

Satellite Receiving Station

Current information indicates that regional satellite receiving stations were damaged or destroyed. These stations are critical for complete meteorological forecasts and other applications.

FORECAST AND EARLY WARNING SYSTEMS

Even before Hurricane Mitch, existing forecast and warning systems in Central America were in need of substantial improvement and modernization. Mitch made a less-than-optimal situation worse with its extensive damage to these forecast and early warning systems. Reconstruction of the systems and preparation for future events requires that the systems be upgraded and, where necessary, replaced using technology appropriate for Central America.

Forecast Systems

Evaluations of conditions before and after Hurricane Mitch indicate a critical need for improved forecast systems for severe storm events, flooding, and other hazards. Facilities such as satellite data receiving stations essential to accurate forecasting were damaged and destroyed and must be replaced.

Hazard Warning Systems

Assessments of the impacts of Mitch indicate the need for more effective forecast and emergency warning systems to alert disaster management personnel, the public, and the media of extreme weather conditions and flooding. Hazards include tropical storms, heavy precipitation, floods, mudslides, droughts, and fires.

Regional Seasonal Climate Prediction

Mitch's effects were exacerbated by seasonal climate variations associated with El Niño-Southern Oscillation (ENSO). The 1997-98 El Niño event resulted in droughts and wildfires throughout much of Central America, only to be followed by intensified hurricane activity during the end of the 1998 season that was likely associated with the rapid shift to La Niña conditions in the early summer. There is a need in the region for the production and application of seasonal climate forecast information in an integrated and systematic fashion. An initiative to meet this need is already underway, supported by NOAA, USAID and the International Research Institute (IRI) for Climate Prediction.

DISASTER PREPAREDNESS AND RESPONSE

To better withstand future storms and other severe natural events, it is important that the affected

countries reconstruct and, where necessary, transform their existing infrastructure to allow them to better prepare for and manage natural disasters.

Strengthening Forecasting, Warning, Preparedness, and Response Institutions

According to available information, a shortage exists of trained personnel at the National Meteorological and Hydrological Services and emergency management agencies in Central America. In addition to the basic meteorological and forecasting skills, there is a need to educate personnel in national agencies about the methodologies and implications of regional climate forecasting, including the use of down-scaled regional models.

HAZMAT Spill Prevention and Response

Petrochemical and other facilities where there is a concentration of hazardous materials put both the public and natural resources at risk from exposure in the event of a natural disaster. According to available information, port and facility contingency plans of the affected countries for preparing for and responding to releases caused by natural disasters are not adequate to reduce threats to public health and safety, and to coastal resources.

Forecast, Warning, and Emergency Response Centers

While each of the affected countries prepared for and responded to Hurricane Mitch with available resources, weather forecasting and warnings of the hurricane's deadly effects were hampered by a lack information and coordination among municipal, national agencies, and regional agencies and organizations.

Reservoir Decision Support Systems

Management of reservoirs is especially critical during extreme natural events such as tropical storms and hurricanes in order to minimize the probability of dam overtopping and possible dam failures. Sufficient flood storage capacity must be available to allow runoff during storms to be safely contained. A dam operations decision support system which provides procedures for operators to maintain proper reservoir levels can be used to prevent catastrophic dam failures.

SUSTAINABLE, RESILIENT COASTAL COMMUNITIES

Improved forecasting of severe events and early warning systems is critical to reducing or

preventing loss of life from natural events such as Hurricane Mitch. Recovery from the economic and environmental consequences of storms like Mitch, however, can take years. Better knowledge of coastal ecosystems, including human health and environmental threats caused by contaminants mobilized by the disaster, and better information about coastal hazards mitigation techniques helps provide the basis needed to implement management practices that are sustainable and resilient.

Supporting Sustainable Uses of Gulf of Fonseca Resources

Mitch devastated the shrimp aquaculture industry in the Gulf of Fonseca and, consequently, a significant part of the Fonseca nations' economies. The Gulf, however, supports many other economic and subsistence uses that were also disrupted. Hurricane Mitch highlighted the need to support sustainable, resilient uses of the Gulf through a better understanding of the area's natural systems and appropriate management and protection programs.

Market Incentives for Resilient Construction

There needs to be better market incentives for developers focused on eco-tourism and other types of development in the coastal zones of the affected countries to construct facilities that are properly sited and resistant to coastal disasters.

Resilient Building Codes/Construction Practices

For developed areas, there is a strong need for building standards and construction practices that help reduce the effects of severe storm events and other threats.

Resources for Sustainable, Resilient Approaches

Local institutions do not have full access to tools and techniques for implementing sustainable, resilient approaches to aquaculture, smaller-scale fishing, and subsistence uses of coastal natural resources. In addition, techniques for building disaster-resistant structures and other coastal hazards mitigation techniques are needed at the local level. Training programs, professional development, workshops for builders, and other mechanisms are needed to increase local applications of appropriate mitigation measures.

ECONOMIC REVITALIZATION

While considerable resources are being devoted by the affected countries to rebuilding structures,

a parallel effort to rebuild confidence in the region's economy is critical. It is important that this confidence be shared both by Central Americans and U.S. investors. Ultimately, it is only by attracting private capital to the region that long-term, disaster-resilient economic growth can be sustained.

III. OBJECTIVES

GOALS AND OBJECTIVES

Consistent with the Commerce Department's environmental and economic mandates, DOC proposes to assist post-Mitch reconstruction in Central America by (1) improving and developing much-needed hydrometeorological forecasting and early warning systems; (2) protecting key ecosystems (in particular those that can mitigate the effects of hurricanes and other severe natural events) and promoting sustainable uses of natural resources; (3) helping Central Americans build stronger, more disaster-resilient housing; and (4) encouraging economic revitalization. Objectives specific to these four areas of focus include the following:

BASE INFRASTRUCTURE RECONSTRUCTION OBJECTIVES

- Provide a foundation for ongoing reconstruction efforts;
- Reconstruct and improve weather forecast and early warning networks;
- Promote safe and efficient air and marine transportation;
- Provide for a geo-spatial data and water level reference framework;
- Provide a basis for reconstruction and improvement of satellite data receiving, processing and analysis capabilities; and
- Ensure that capacity exists to maintain and expand new base infrastructure.

FORECAST AND EARLY WARNING SYSTEMS OBJECTIVES

Short Term

- Strengthen and develop basic national tropical storm and flood early warning capabilities;
- Provide climate forecast information for the current rainy season that can be used by national, regional, and international relief and construction efforts; and
- Reconstruct and improve hydrometeorological monitoring networks to support national and regional data needs, including support of U.S. regional responsibilities for tropical

cyclone forecasting.

Longer Term

- Improve national and regional disaster preparedness and response infrastructures for forecasting, managing, and mitigating weather-related natural disasters; and
- Build from basic capabilities to develop more sophisticated national and regional water resources management and early warning tools.

DISASTER PREPAREDNESS AND RESPONSE OBJECTIVES

- Improve national and regional disaster preparedness and response infrastructures for forecasting, managing, and mitigating weather-related natural disasters;
- Build local capacity for preventing and responding to hazardous materials spills; and
- Develop and transfer a framework for developing contingency plans for releases of hazardous materials during severe storms.

SUSTAINABLE, RESILIENT COASTAL COMMUNITIES OBJECTIVES

- Develop an improved understanding of the Gulf of Fonseca's natural processes in support of more sustainable uses of the Gulf by industry and artisans, and for subsistence;
- Develop appropriate resilient building codes and construction practices for at-risk areas;
- Help promote market incentives for appropriate land uses and resilient construction practices; and
- Work within existing programs (e.g., PROARCA/COSTAS) to transfer information and tools for sustainable aquaculture, building practices, and other coastal management approaches that promote resilience and sustainability.

ECONOMIC REVITALIZATION OBJECTIVES

- Promote the development of trade and trade infrastructure that is disaster resilient.
- Increase the transparency of government contracting in Central America and facilitate the

continued adoption of open market economic rules;

- Increase the availability of information in the United States about business opportunities in Central America that would accelerate reconstruction; and

- Expand the presence of and use of the Department's U.S. and Foreign Commercial Service officers to help companies interested in working in the region.

IV. APPROACH

DOC's plan is designed to address the problems identified above in Section II. The plan, by design, has a strong training and capacity building component. The Department believes that capacity building is integral to strengthening and rebuilding infrastructure. Without appropriate training, systems will not be self-sustaining and could fail. Training additionally provides an excellent opportunity to evaluate the technological level a host country is capable of sustaining and, where necessary, allows for the adjustment of design and delivery systems.

The Department's emphasis on capacity building and training make it particularly important that DOC consolidate and coordinate its activities with that of other agencies and work closely with agencies to maximize the effectiveness of the entire U.S. government's reconstruction efforts in Central America. To this end, the Department will engage the assistance of other agencies in performing the work outlined here.

As part of its efforts to coordinate its work with that of other agencies, DOC will work within existing cooperative agreements and programs wherever possible to take advantage of work that has been completed to date. In addition, DOC will seek to leverage the assistance of the international donor community to ensure the Department's activities support and enhance that assistance, and will make every effort to engage the private sector, where appropriate, in implementing its proposals.

Although DOC's proposed activities will be performed over the required two-year time period, the Department's programs have been carefully selected to provide the foundation for sustainable, long-term solutions to the problems identified. They have also been crafted to support other national, U.S. government, and international efforts to respond to the problems caused by Hurricane Mitch.

BASE INFRASTRUCTURE RECONSTRUCTION

RECONSTRUCT AND IMPROVE GEODETIC CONTROL NETWORKS

A hierarchy of high order continuously operating remote global positioning system stations, a highly accurate network of bench marks, and a denser network designed for traditional survey applications will support positioning needs ranging from air and sea navigation to private land boundary determinations. DOC's proposal is based on similar work that the Department, through NOAA, performed in Romania under USAID auspices to rebuild that nation's geodetic reference framework in the mid-1990s.

Following reconnaissance visits to Honduras, Nicaragua, Guatemala, and El Salvador, DOC/NOAA will work with appropriate in-country agencies to set requirements and to design a system that both allows the nations to participate fully in the international geodetic, positioning, and navigation communities and meets requirements for classical positioning. DOC will contract for the physical installation, but will engage in-country experts fully in the planning and execution process.

Physical Installation

The physical geodetic network installation includes a base network of Continuously Operating Reference Stations (CORS) in Honduras and Nicaragua and potentially in Guatemala and El Salvador. This base network, developed in consultation with national survey and mapping, and navigation and transportation agencies, will support multiple activities from safer and more efficient air and marine navigation to geophysical research. For cost savings and efficiency reasons, the CORS stations will be co-located with stations DOT installs under that department's proposal for establishing Differential Global Positioning System (DGPS) navigation capabilities in Central America. To link the CORS network to the physical monuments used in land surveying and other applications, DOC will also install primary and secondary networks of physical networks in more populated coastal areas. Finally, DOC will support local development of densified network of cadastral control points as required in key coastal areas with technical assistance, equipment, and training.

These geodetic network elements will provide the Central American nations with a hierarchy of control to meet a full range of requirements from boundary determinations to scientific applications. The physical installation parallels the U.S. geodetic network. The compatibility among the networks will help promote information and technology exchange and capacity building.

System Support and Capacity Building

To support the geodetic network and build national capacity for its use and expansion, DOC will supply necessary equipment and training to appropriate in-country government agencies. In addition, DOC will (1) work to integrate the physical installation of the network into national survey and mapping, transportation, and navigation agencies through an in-country training program; (2) develop and deploy data bases to process, store, and disseminate control and cadastral survey data; and (3) provide training in the United States for a limited number of agency representatives on technical issues, such as geodetic adjustments, CORS network design and maintenance, and field operations.

Resources Required: DOC/NOAA estimates two person-years for program management and contract oversight. Training, information exchange and other capacity building

activities will require additional personnel resources. Eight to ten person field parties will require travel and logistical support for the two year project life. Equipment and construction supplies for establishing CORS sites, and geodetic networks will also be required. DOC/NOAA expects to cover program management and other support from existing resources.

RECONSTRUCT AND IMPROVE HYDROMETEOROLOGICAL DATA COLLECTION NETWORKS

DOC will reconstruct and supplement key hydrometeorological monitoring and telecommunication networks. According to available information, data collection platforms (DCPs) throughout the affected countries were destroyed or are in a state of disrepair.

The DCPs collect various data such as streamflow, precipitation, wind speed and direction, temperature, and humidity and are critical to managing extreme weather-related events. Automated weather stations located throughout the region were also damaged. As a short-term priority, DOC will assist in the repair, replacement, and improvement of these monitoring networks, including telecommunications in each country. To the extent practicable, the hydrometeorological data collection networks will be linked to the tide gauge networks described below to augment system capabilities.

Resources Required: Much of this work will be performed by DOC/NOAA contractors (including management of U.S. and Central American-based resources). A significant portion of the estimated total cost is for hardware. Approximately three months of FTE effort is anticipated for oversight and coordination, including a minimum of two trips.

RECONSTRUCT AND IMPROVE TIDE GAUGE NETWORKS

Replacement of destroyed tide gauges and improvements to existing gauges will support predictions and warning of flood conditions, help support safe and efficient maritime commerce, support surveying, mapping, and coastal engineering activities, and support coastal resource management.

DOC will conduct detailed in-country assessments in Guatemala, Nicaragua, Honduras, and El Salvador to guide its activities under this task. This assessment will include a documentation of requirements for tide gauge data, identification of appropriate counterpart agencies, and identification of appropriate data distribution mechanisms. Tide gauges are required to support the geodetic work proposed elsewhere in this proposal, and to support research and monitoring in

the Gulf of Fonseca. Other requirements exist to augment flood warning networks, to support maritime commerce, and for other applications in coastal resource management and research.

Physical Installation

DOC/NOAA will select and direct the efforts of a contractor in the installation of gages at critical location and establishing data collection and processing systems. The locations of these stations will be determined in consultation with national meteorological, navigation, and coastal management agencies to support multiple uses for sea level data. Tide gauges and associated quality control infrastructure will be equivalent to existing equipment used in the U.S. water level network.

System Support

To complement the physical installation of gages, DOC/NOAA will provide training for national hydrological and meteorological service personnel in tide station installation, operation and maintenance and quality assurance both in-country and in the United States. The Department will also promote the integration of the physical installation into national meteorological, maritime, and coastal management agency operations through an in-country training program for responsible agencies.

Resources Required: This activity will require one FTE for on-site reconnaissance and program oversight. An additional FTE will provide training, daily quality assurance, and data management. Contractors would conduct most of the work in cooperation with appropriate local authorities. Hardware costs include tide gauge primary and backup sensors, supporting equipment, and communications and computing equipment.

DEVELOP SATELLITE DATA RECEIVING, PROCESSING AND ANAYLSIS CAPABILITIES

According to available information, satellite data receiving stations used to acquire satellite imagery of precipitation, weather systems and other important data were compromised by Hurricane Mitch. As the first step toward reconstructing the necessary satellite data receiving stations, DOC/NOAA proposes to install a single satellite receiving station capable of providing high-resolution satellite images from geostationary and polar-orbiting satellites at a National Meteorological and Hydrological Services (NMHS) office that is central to the affected countries.

This receiving station would allow for access to high-resolution satellite imagery in real-time that is important for short-term weather and hydrologic forecasting, early storm warnings, hurricane

tracking, and the monitoring of vegetative stress, droughts, and fires. Imagery from satellites can be supplemented with digital data from hydrometeorological data collection networks in assessing storm impacts in near real-time. In addition to upgrading satellite imagery receiving capabilities, DOC/NOAA proposes to develop a technique to estimate precipitation totals using available satellite data. This capability will improve the spatial coverage of precipitation estimates and will be invaluable during significant precipitation events. Once all of this information is received at the central location, it can be disseminated to other NMHSs via the Internet or facsimile. Satellite precipitation estimates can also be disseminated through the central office, making this office a focal point for all satellite-based products. In addition to being transmitted to the other NMHSs for use in estimating precipitation distribution, satellite precipitation estimates can also be inputted into the proposed flood forecast system, which can be co-located at the central NMHS office.

Resources Required: Much of this work will be performed by DOC/NOAA contractors. A portion of the estimated total cost is for hardware. Approximately two months of FTE effort is anticipated for oversight and coordination, including a minimum of two trips for FTE support.

FORECAST AND EARLY WARNING SYSTEMS

NATIONAL STRATEGIC IMPLEMENTATION PLANS

DOC/NOAA will work with Honduras, Guatemala, El Salvador, and Nicaragua to help these countries develop long-term strategic implementation plans to address the restoration, development, operation, and maintenance of hydrometeorological forecasting and early warning system infrastructure. Each national plan will provide recommendations and approaches for improving or developing self-sustaining warning and forecasting capabilities for vulnerable watersheds and coastal areas. In addition, the plans will address other water-related environmental disasters such as drought. The basic framework for these plans was developed at a flood forecasting and disaster response workshop sponsored by DOC/NOAA in Tegucigalpa, Honduras April 6-9 this year.

During the preparation of the national plans, DOC will evaluate programs implemented or proposed by donors to ensure that efforts are not duplicated and to ensure that proposed programs are consistent with the countries' national and regional flood forecasting and early warning plans. Creation of the strategic implementation plans is crucial for obtaining future donor support for additional reconstruction and improvement of meteorological and hydrologic services in the affected countries.

Resources Required: Most of this work will be performed by DOC/NOAA contractors.

Approximately one month of FTE effort is anticipated for oversight and coordination, including a minimum of one trip for FTE support.

RECONSTRUCT AND IMPROVE FLOOD WARNING NETWORKS

DOC/NOAA will install ALERT (Automated Local Evaluation in Real-Time) local flood warning systems at selected locations in the affected countries. Priority will be given to those areas especially prone to flash flooding and with the most vulnerable populations. ALERT is a community-based system designed to provide local officials with sufficient information in advance to respond swiftly and effectively. The use of an ALERT system is an integral part of a local emergency action plan. The system will provide the necessary information to evaluate immediate flood potential from rainfall that has already fallen and will assist in evaluating the risk to the local area from additional rain in the near future.

The system is designed to provide the minimum technology needed to obtain flood warnings for flash flood prone river basins. DOC/NOAA, in partnership with the private sector, will design and install the systems and provide the necessary training on operation and maintenance.

This project is part of a collaboration between DOC/OAA and the USGS and depends, in large part, on the stream gauge project proposed by the USGS, also under consideration for funding under the emergency supplemental funding bill.

Resources Required: Much of this work will be performed by DOC/NOAA contractors (including management of U.S. and Central America-based resources). A significant portion of the estimated total cost is for hardware. Approximately three months of FTE effort is anticipated for oversight and coordination, including a minimum of 3-4 trips for FTE support.

ESTABLISH FLOOD FORECAST SYSTEMS

DOC/NOAA will implement a nationally-based flood forecast system such as the National Weather Service River Forecast System (NWSRFS) or an advanced, automated ALERT-type system for especially vulnerable river basins in Honduras and Nicaragua. (This system would be implemented and run by a national agency such as the National Meteorological and Hydrologic Service or the emergency management agency as opposed to the more simplified, more local, community-based ALERT system.) The river basins will be identified through consultation with

the countries and U.S. AID missions. Based on an evaluation of needs and available resources, either the NWSRFS, which is a technologically advanced hydrologic forecast tool or an automated ALERT-type system, will be implemented within each of the two countries for use by the National Meteorological and Hydrologic Service or the emergency management agency. A system such as the NWSRFS can provide the framework for the development of a regional disaster preparedness and response center discussed below.

The NWSRFS is currently in use in the thirteen river forecast centers in the United States and is in the process of being implemented in Mexico, Panama (for the Panama Canal) and South Africa. The system is a key element for integrated water resources management and flood forecasting. NWSRFS software modules provide real-time hydrologic modeling and forecasting, including potential capabilities for mudslide forecasts, and long-range probabilistic hydrologic forecasting. An automated ALERT system can provide the same basic forecasting capabilities but without some of the additional enhancements found in the NWSRFS.

Resources Required: Much of this work will be performed by DOC/NOAA contractors. A small portion of the estimated total cost is for hardware such as scientific workstations and personal computers. Approximately six months of FTE effort is anticipated for oversight and coordination and technical work (including software and communication systems support). Minimal FTE travel is expected with a minimum of two trips planned.

DEVELOP REGIONAL SEASONAL CLIMATE PREDICTION SYSTEM

DOC/NOAA will implement a regional, seasonal climate prediction system (RSCPS) in Central America. This system, a component of an existing regional atmospheric model, already has shown great promise in simulating observed rainfall variability for critical seasons in the region. Its products are similar to the El Niño/La Nina products DOC/NOAA now produces that provide general information about seasonal climate variations. DOC will provide full implementation of the RSCPS in the affected countries, including validation of the model, acquisition, and installation of the necessary computer equipment, training, technology transfer, and support. The RSCPS will be supported by regularly scheduled pre-, mid-, and post-season Climate Outlook workshops.

Recognizing the vulnerability of the Central American population to additional flooding, given the current rainy season, DOC/NOAA will take immediate steps to make rainfall estimates and forecast information available to the appropriate national and regional authorities via the Internet and other dissemination systems. This information will be useful in the short term to recognize and evaluate potential tropical storm and flood threats.

Resources Required: This project will require one full-time FTE.

DISASTER PREPAREDNESS AND RESPONSE

STRENGTHEN FORECASTING, WARNING, PREPAREDNESS, AND RESPONSE INSTITUTIONS

Capacity building is integral to strengthening forecast, warning, preparedness, and response infrastructure and systems. Without appropriate training, systems will not be self-sustaining and could fail. Training provides the opportunity to evaluate the level of technological sophistication that a host country is capable of sustaining.

According to available information, Central America has a shortage of staff appropriately trained in hydrometeorological forecasting and early warning systems. DOC/NOAA will provide training for hydrologists, meteorologists, agronomists, decision-makers, and the media in climate forecasting and climate forecast applications. More specific training on climate prediction techniques and climate monitoring will be provided to the National Meteorological and Hydrologic Services staff.

Structured Training and Capacity Building

As part of the development of the National Strategic Implementation Plans, DOC/NOAA will conduct a full assessment of training and capacity building needs for the National Meteorological and Hydrological Services. To meet these requirements, DOC, in cooperation other department bureaus, U.S. government agencies (in particular, the Federal Emergency Management Agency (FEMA) and the USGS), the private sector, and the international donor community, will offer a coordinated program of training and capacity building to strengthen local, national, and regional institutions. DOC will seek to deliver this coordinated program in collaboration with local organizations (such as Comite Regional de Recursos Hidricos (CRRH) in Costa Rica), local universities, international organizations, and other in-country institutions. The Department will also work through the network of local level "extension agents" described below, as appropriate.

Based on its initial assessments, DOC/NOAA plans to offer training in the following areas:

- Hydrologic and tropical meteorological modeling and forecasting (applications and operations);

- Hydrometeorological data collection, analysis, applications, and data base management;

- Hydrometeorological data collection network design, siting, and maintenance;

- Flood preparedness and response, including ALERT system operations; and

- Scientific workstation operations and administration.

Examples of specific training courses which may be offered include: Basic Hydrology, UNIX Operating System (computer workstations), Operational Hydrology, NWSRFS workshops, operational experience at U.S. River Forecast Centers and Weather Forecast Offices, and operational experience at the National Hurricane Center.

Outreach and Continuing Support

In addition to the above training, DOC will sponsor several technical workshops designed to foster communication, cooperative development, and monitor program progress. Examples of such activities include:

- *Annual Workshops.* DOC will sponsor annual workshops in Nicaragua, Honduras, El Salvador, and Guatemala on a range of disaster response activities, from early warning systems to disaster response and management. Invitees for the workshops will include persons who are involved in any aspect of disaster management, including emergency response personnel, users of the information, and the media. DOC will coordinate these workshops with FEMA.

Regional Seasonal Climate Prediction Workshops. DOC/NOAA, in partnership with USAID/OFDA, will host pre-, mid-, and post-seasons workshops to assist with the development of the Regional Seasonal Climate Prediction System. In addition to providing information about seasonal trends, the workshops will be used to assess climate and water-related information needs.

Resources Required: Much of the above work will be split between DOC/NOAA personnel, contractors and universities (e.g., University of Costa Rica). The FTE support is expected to be equivalent to two full-time FTEs over the two-year period.

DOC/NOAA will take leadership in exploring the development of a Center for Disaster Reduction located in Central America. Much as the NOAA's National Hurricane Center serves the United States and the Caribbean Basin, a Center for Disaster Reduction could serve as a focal point for regional forecasting and warning and provide a coordinated approach to managing natural disasters.

A Center for Disaster Reduction could house data collection and information dissemination requirements for many of the activities in this plan. A modern satellite data receiving station could also be located at the Center to take advantage of analysis and dissemination systems that would also be located there. A National Weather Service River Forecast System (NWSRFS), discussed above, could eventually be resident in the Center, modeling other river basins in addition to those in the prototype flood forecast systems implemented under the supplemental funding.

Additionally, the Center could provide the forum for future professional development and training, and provide the means for concerted efforts in requesting technical cooperation in areas such as vulnerability studies, technology transfer, regional modeling, technology applications and data gathering, system maintenance, and hydrometeorological data quality control. Training and capacity building, and other U.S. agency activities (such as FEMA's training institute) could be housed at the Center also. Because of its importance to support all countries in the region, and its potential use for more than forecasting, the Center would be physically located in Central America.

In consultation with the affected countries and regional organizations, such as the Central America Integration System (including CEPREDENAC and CRRH), DOC will develop the framework and a proposal for the Center, including logistics (e.g., telecommunications networks, staffing), location, and funding requirements.

> *Resources Required:* Much of this work will be performed by DOC/NOAA contractors. Approximately three months of FTE efforts are anticipated for oversight and coordination, including a minimum of one trip for FTE personnel.

RESERVOIR DECISION SUPPORT SYSTEM

DOC/NOAA will provide technical assistance to the Dominican Republic to develop a framework for a simplified decision support system to manage critical reservoirs during extreme rainfall events such as tropical storms and hurricanes. The system will integrate weather-related data along with reservoir operating procedures to manage reservoirs to prevent dam overtopping and failure. The technical assistance will involve an evaluation of needs, requirements and provision

of procedures and guidelines for the decision support system framework. DOC/NOAA will coordinate this activity with the World Bank project to improve the meteorological service forecast capabilities in the Dominican Republic, especially data measurement and collection programs.

Resources Required: Much of this work will be performed by DOC/NOAA contractors. Less than one month of FTE efforts are anticipated for oversight and coordination, including a minimum of one trip for FTE personnel.

HAZMAT Spill Prevention and Response

Releases during storm events from petrochemical refineries and plants, storage areas, terminals, and other facilities events pose a particular threat to coastal resources, and to human health and safety. DOC will work with national and local officials to reduce the risk of releases and to facilitate appropriate responses when releases do occur in the following areas: port and facility management and contingency planning, sensitive resources mapping, and capacity building through technology transfer and training.

Implementing this proposal first requires an assessment of the present status of hazardous materials in the region. Working jointly with local authorities, DOC will map the distribution, transport, and storage of oil and other chemicals. Facilities where oil or chemicals are stored, and whose integrity was compromised by Hurricane Mitch, will be identified in this initial assessment. Working in coordination with G-CAP, CCAD organizations, and others, as appropriate, DOC will conduct an initial assessment and focus its activities in the following areas:

Port and Regional Contingency Plans

Working jointly with local coastal and marine management programs and implementing agencies, DOC will provide technical assistance to develop a template for port or regional specific contingency plans. A prototype contingency plan for response to spills will be developed by modifying examples that DOC/NOAA has developed with officials and scientists from ports in the Peoples' Republic of China and the International Maritime Organization.

After initial agreement on the scope of the planning effort, DOC/NOAA will work with regional representatives to complete the plans and develop testing and maintenance protocols. After the plan for a specific port has been implemented, a spill drill or exercise can be conducted at the prototype port to test the plan. Once implementation and testing of the initial plan is complete, appropriate local authorities could complete plans for other ports with advice or guidance from DOC as needed.

Environmental Sensitivity Indexes: East Coasts of Guatemala, Honduras, and Nicaragua

Environmental Sensitivity Index (ESI) maps are standard tools for spill preparedness and response in the United States. ESI methodologies and products are used in many places around the world, including El Salvador, to rank shoreline sensitivity to oil pollution. ESI maps for the Caribbean coasts of Guatemala, Honduras and Nicaragua would provide these countries with a standard approach to assess vulnerability and risk of resources to threats from hazardous materials releases.

Technology Transfer and Training in Spill Prevention and Response

DOC/NOAA will provide standard spill prevention and response products to national and local officials, including a Spanish-language version of CAMEO, a computer database and display tool for responding to spills. The Department will also provide training to regional response personnel and local authorities on scientific and environmental issues associated with responding to spills of oil and other hazardous materials. This training would focus on prediction of pollutant movement and protection of environmental and public resources. Working jointly with other department bureaus and U.S. government agencies, the training can be expanded to include more operational issues and restoration considerations.

Resources Required: This project would require one FTE for program management and oversight. Much of the work would be conducted by contractors. Travel for local personnel to conferences and training in the United States, equipment (e.g., laptop computers, appropriate software), and printing, and distribution are also required.

SUSTAINABLE, RESILIENT COASTAL COMMUNITIES

Recovery from the economic and environmental consequences of storms like Hurricane Mitch can take years. Better knowledge of coastal ecosystems, including human health and environmental threats caused by contaminants mobilized by the disaster, and better information about coastal hazards mitigation techniques helps provide the basis needed to implement management practices that are sustainable and resilient.

The projects presented below represent an integrated DOC-wide approach to promoting sustainable, resilient coastal communities. These activities will be implemented through USAID's regional program and its country missions in cooperation with other U. S. government and appropriate in-country government agencies and NGOs. The projects address elements of sustainable uses of coastal ecosystems, on the one hand, to market incentives for resilient

construction and appropriate land use decisions on the other. Collectively, the projects fit within the existing framework for local action in the coastal zone currently provided by PROARCA/COSTAS. DOC proposes to develop a protocol and/or a memorandum of understanding with COSTAS that details how the Department will work within the COSTAS framework.

DOC's sustainable, resilient communities activities will be most effective when coordinated with activities of other U.S. government agencies such as the USGS's research activities in the Gulf of Fonseca and its mapping and other information development activities, and USDA's activities in watershed reconstruction and aquaculture.

SUPPORTING SUSTAINABLE USES OF GULF OF FONSECA RESOURCES

USAID's missions in Honduras, Nicaragua, and El Salvador; and its Regional Program have invested heavily in the Gulf of Fonseca to further ecosystem health, resource protection, and sustainable practices, with the goal of ensuring that shrimp aquaculture and other uses of the Gulf of Fonseca's natural resources are both economically productive and sustainable.

Hurricane Mitch's effects on the aquaculture industry, natural resources, and the watersheds that drain into the Gulf are well documented in USAID Special Objectives and other documents: in addition to the direct destruction of farms and facilities, damage to watersheds released tons of sediment, swept pesticide and other farm chemicals from storage depots into the Gulf, and potentially mobilized DDT and other long-lived chemical agents from soil and sediment in the watersheds that drain to the Gulf.

DOC, working closely with the USGS and the USDA, in collaboration with USAID's missions and Regional Program, proposes to conduct specific research and monitoring activities to support sustainable shrimp aquaculture in the Gulf of Fonseca. In addition, the Department proposes to help fund initial implementation of the existing proposal for a management plan for the Gulf (Corredor Biologico Mesoamericano Pacifico de Honduras).

Research and Monitoring

As part of its proposed work for the region, USGS proposes to conduct significant research and monitoring to address key questions including, among others, mangrove recovery and restoration, sedimentation, and the health of indigenous shrimp populations. These activities, however, do not address the full set of questions that need to be addressed to understand and mitigate against Mitch-related effects or to build resiliency into the shrimp aquaculture economy.

USGS and DOC have reached an agreement in principle to work jointly in the Gulf of

Fonseca under a unified research and monitoring program to ensure maximum benefit from each agency's areas of expertise and activities and to promote cooperation with other entities conducting research in the Gulf. Working cooperatively with the USGS, DOC/NOAA proposes to help re-establish a sustainable Gulf of Fonseca shrimp aquaculture industry by:

- establishing a monitoring program in the Gulf of Fonseca for DDT and other long-lived contaminants and for farm chemicals. The monitoring program would be designed to document existing levels of contamination and would help identify sources of origin. The program would be designed to complement and, where possible, directly support related USGS water quality and sediment chemistry monitoring sites.

  Importantly, DOC will engage the aquaculture industry in the design and implementation of the monitoring program to ensure that industry needs for monitoring information are met and to invest industry in sustaining the monitoring program in the future. While focusing in the Gulf, the monitoring effort will extend into key watersheds so that the movement of contaminants may be tracked.

- deploying tide gauges to support circulation and sediment transport analyses, UGSG studies on mangrove restoration, water quality studies, and other research and monitoring. These gauges are also needed to establish local sea level needed for DOC's proposal to establish geodetic networks in Central America.

Resource Management

To complement the research and monitoring conducted by DOC, USGS, USDA, and others, DOC proposes to help support initial implementation of the Mesoamerica Biological Corridor in the Gulf of Fonseca (Corredor Biologico Mesoamericano Pacifico de Honduras). This protection and management plan for the Gulf was developed by NGOs working cooperatively with industry and the Honduran government toward a consensus to protect key areas from development.

Resources Required: The above work will require one FTE for program management and oversight. It is anticipated that much of the work will be conducted by contractors. Travel, equipment printing, and distribution are also required.

DOC will implement a system for assessing the effects of long-term weather trends in the context of coastal hazards mitigation. Using information the system provides, decision-makers can prepare for the climatic conditions. In addition, the information can be used by the agriculture, water management, public health, transportation and public infrastructure sectors, all of which were severely affected by Hurricane Mitch and the El Niño-related droughts and wildfires that preceded the hurricane.

Resilient Building Codes and Construction Practices

DOC/NIST has formed a partnership with the Department of Housing and Urban Development to develop locally and regionally appropriate building standards and practices to resist severe storms and other coastal hazards. The effort will focus on the Caribbean at the request of the Dominican Republic and other nations. DOC will engage local building officials, contractors, engineers, and other in-country experts in the process of developing the standards and practices.

One early product will be an accessible, picture book format publication on best practices. The audience will be local builders in the informal sector and homeowners. In addition, DOC/NIST experts will work with other U.S. government agencies and the international donor and financing communities to design initiatives that can support systematic upgrading and regional standardization of building codes. Finally, DOC will work within the Caribbean region to develop approaches and possible initiatives that can begin to address the issue of code enforcement. A key issue to be considered is what regulatory mechanisms and incentive structures can be designed to assure enforcement. DOC, in conjunction with leaders from the Caribbean region, will work with the public and private sector to launch a pilot project to achieve the above objectives.

Market Incentives for Resilient Construction

In partnership with Central America, U.S. insurance companies, and the U.S. Institute for Business and Home Safety, DOC will promote the use of insurance instruments and other market incentives that encourage resilient building construction and siting.

Local Capacity Building and Support Network

DOC's activities depend heavily on engaging the relevant local agencies and decision-makers in building capacity so that the information and resulting products can be used effectively. Building capacity and developing appropriate support networks are also critical for the dissemination of information and to ensure that the results of these efforts will be transferred to and implemented in other areas in the region.

Using the "extension agent" model, DOC/NOAA will train and place individuals in coastal areas in consultation with USAID's missions and through existing outreach mechanisms. These extension agents will be involved in all of DOC's reconstruction activities so that they can facilitate information transfer, assist the Department and other U.S. government agencies in developing local and national relationships, and help organize training courses, workshops, and other more formal vehicles for building capacity. Importantly, a concerted effort will be made to train a network of in-country educators in the government, industry, and educational system to help assure an ongoing network of extension agents once formal reconstruction activities by the U.S. government have ended. DOC will conduct a detailed assessment of outreach and training requirements with USAID missions before beginning its activities under this task.

ECONOMIC REVITALIZATION

While the affected countries will devote considerable resources to rebuilding structures, a parallel effort to rebuild confidence in the region's economy is also critical. This confidence must be shared by both Central Americans and U.S. investors. Ultimately, it is only by attracting private capital to the region that long-term, disaster-resilient economic growth can be sustained. DOC has already undertaken a number of initiatives to achieve this end. These initiatives include hosting a major conference on business opportunities in January 1999, leading a trade mission to the region in March 1999, and providing information to and working closely with companies desiring to take humanitarian action.

DOC will continue these efforts and will supplement them with a number of activities aimed at building confidence and promoting the concept that disaster minimization is good business. Proposed activities include:

- Holding regional trade and investment forums, including one co-hosted with the Central American governments, similar to the one held by the late Secretary Ronald Brown in 1996;

- Providing expert input on trade development and commerce issues to other agencies involved in the reconstruction;

- Developing a trade corridors conference; and

- Leading another trade development mission to Central America.

Resources Required: Most of these activities are performed as part of existing DOC programs. However, DOC will incur expenses to execute some of the activities, particularly those related to the investment forums and the proposed trade corridors conference. These expenses include travel, materials, and consultant fees.

V. APPROACH BY COUNTRY

Section IV provided an overview of the tasks proposed by DOC designed to address the problems identified in Section II. A portion or all of each of the proposed tasks will be performed in the affected countries or on a regional basis. Based on discussions with USAID's missions and various national and regional governmental agencies and organizations over the past several months, DOC has developed a breakdown of proposed activities in the affected countries and the region. These are as outlined below. A more detailed discussion of each activity categorized by Problem Area (see Section II) is provided in Section IV. DOC's activities are limited to Honduras, Nicaragua, Guatemala, El Salvador, the Dominican Republic and the Region overall (with the proposed regional tasks benefiting all of the affected countries in Central America).

Honduras

Problem Area	Activities
Base Infrastructure Reconstruction	• Reconstruct and Improve Geodetic Control Networks • Reconstruct and Improve Hydrometeorological Data Collection Networks
Forecast and Early Warning Systems	• Reconstruct and Improve Flood Warning Networks • Establish Flood Forecast System • National Strategic Implementation Plan • Training and Capacity Building
Disaster Preparedness and Response	• Strengthen Forecasting, Warning, Preparedness, and Response Institutions (Training and Capacity Building) • HAZMAT Spill Prevention and Response
Sustainable, Resilient Coastal Communities	No Activities Proposed
Economic Revitalization	No Activities Proposed

Nicaragua

Problem Area	Activities

Problem Area	Activities
Base Infrastructure Reconstruction	• Reconstruct and Improve Geodetic Control Networks • Reconstruct and Improve Hydrometeorological Data Collection Networks • Reconstruct and Improve Tide Gauge Networks
Forecast and Early Warning Systems	• Reconstruct and Improve Flood Warning Networks • Establish Flood Forecast System • National Strategic Implementation Plan • Training and Capacity Building
Disaster Preparedness and Response	• Strengthen Forecasting, Warning, Preparedness, and Response Institutions (Training and Capacity Building)
Sustainable, Resilient Coastal Communities	No Activities Proposed
Economic Revitalization	No Activities Proposed

Guatemala

Problem Area	Activities

Problem Area	Activities
Base Infrastructure Reconstruction	• Reconstruct and Improve Geodetic Control Networks • Reconstruct and Improve Hydrometeorological Data Collection Networks
Forecast and Early Warning Systems	• Reconstruct and Improve Flood Warning Networks • National Strategic Implementation Plan • Training and Capacity Building
Disaster Preparedness and Response	• Strengthen Forecasting, Warning, Preparedness, and Response Institutions (Training and Capacity Building)
Sustainable, Resilient Coastal Communities	No Activities Proposed
Economic Revitalization	No Activities Proposed

El Salvador

Problem Area	Activities
Base Infrastructure Reconstruction	• Reconstruct and Improve Hydrometeorological Data Collection Networks
Forecast and Early Warning Systems	• Reconstruct and Improve Flood Warning Networks • National Strategic Implementation Plan • Training and Capacity Building
Disaster Preparedness and Response	• Strengthen Forecasting, Warning, Preparedness, and Response Institutions (Training and Capacity Building)
Sustainable, Resilient Coastal Communities	No Activities Proposed
Economic Revitalization	No Activities Proposed

Dominican Republic

Problem Area	Activities
Base Infrastructure Reconstruction	No Activities Proposed
Forecast and Early Warning Systems	No Activities Proposed
Disaster Preparedness and Response	• Reservoir Decision Support System
Sustainable, Resilient Coastal Communities	• Resilient Building Codes and Construction Practices
Economic Revitalization	No Activities Proposed

Regional

Problem Area	Activities
Base Infrastructure Reconstruction	• Coordinate and Link Geodetic Control Networks • Coordinate and Link Tide Gauge Networks • Develop Satellite Data Receiving, Processing and Analysis Capabilities
Forecast and Early Warning Systems	• Develop Regional Seasonal Climate Prediction System
Disaster Preparedness and Response	• Strengthen Forecasting, Warning, Preparedness, and Response Institutions (Training and Capacity Building) • HAZMAT Spill Prevention and Response • Develop an Approach for a Regional Center for Disaster Reduction
Sustainable, Resilient Coastal Communities	• Supporting Sustainable Uses of Gulf of Fonseca Resources • Long-term Weather Trends Analysis for Hazards Mitigation • Local Capacity Building and Support Network • Market Incentives for Resilient Construction
Economic Revitalization	• Various Activities

Based on requests from the USAID missions during in-country meetings, the breakout of some activities by problem area may differ slightly from Section IV for individual countries.

V. PERFORMANCE INDICATORS

Progress toward accomplishing many of the tasks outlined in this plan may be measured with relatively prosaic milestones. The more significant performance indicators are those that identify whether DOC has achieved its stated objectives of improving base infrastructure, providing for better forecasting and early warning systems, improving national and regional disaster preparedness and response measures, promoting sustainable, resilient communities, reducing exposure to coastal hazards, and promoting overall economic stability in the region.

To track the qualitative measures of effectiveness, DOC will review selected events to determine whether improvement is evident as experience is gained. To monitor performance and progress, close contact will be maintained with the relevant institutions and individuals in each country and the region. Scaled down versions of the evaluation that DOC/NOAA conducts after each major weather-related disaster to assess its own performance will be conducted as appropriate to assess how well various forms of DOC assistance have been incorporated into the decision-making process at the local, regional, and national levels. In addition, DOC will sponsor regional workshops at the end of each year to obtain input and to allow open discussions regarding the programs being implemented. These workshops will provide an indication of the performance of the programs and the progress made by DOC and the affected countries.

DOC has developed representative performance indicators that measure both progress and effectiveness for each of the proposed areas. They include the following:

BASE INFRASTRUCTURE RECONSTRUCTION

RECONSTRUCT AND IMPROVE GEODETIC NETWORKS

Measures of progress:

- The number of continuously operating reference stations (CORS) that are installed;
- "Train the trainer" sessions held for U.S. private contractors and U.S. and Central American academic institutions;
- The number of first, second, and third order benchmarks that are installed; and
- Training sessions held for in-country government agencies responsible for surveys.

Measures of effectiveness:

- Use of new geodetic capabilities in navigation, geospatial information, land survey applications;
- The number of new networks installed without direct U.S. support;
- Central American participation in U.S./Caribbean/South American initiatives to coordinate geodetic reference frameworks, navigation protocols, and related areas.

RECONSTRUCT AND IMPROVE HYDROMETEOROLOGICAL DATA COLLECTION PLATFORM/TELECOMMUNICATIONS NETWORKS

Measures of progress:

- The number of Data Collection Platforms (DCPs) that are installed;
- The percentage of telecommunications network installed; and
- The number of connections to other sensors, such as tide gauges, that are established.

Measures of effectiveness:

- The maintenance of and improvements to DCP and telecommunications network; and
- New forecasting and warning systems that are built on base DCP/communications capacity.

RECONSTRUCT AND IMPROVE TIDE GAUGE STATIONS

Measures of progress:

- The number of sea level stations that are installed;
- Training sessions held for in-country government agencies responsible for operating water level stations, assuring data quality, and providing sea level data.

Measures of effectiveness:

- The use of new tide stations in navigation and coastal zone management applications;
- The use of tide stations for coastal hazard vulnerability assessment and mitigation;
- Increased Central American participation in U.S./Caribbean/South American initiatives to coordinate navigation protocols; and
- Ongoing U.S.-Central America relationships focused on long-term sea level rise issues.

DEVELOP SATELLITE DATA RECEIVING, PROCESSING AND ANALYSIS CAPABILITIES

Measures of Progress:

- Complete installation of satellite image receiving capability; and
- Completion of operational satellite precipitation estimate capability.

Measures of Effectiveness:

- Improved precipitation estimates resulting in improved streamflow determinations;
- Damage assessments used to leverage donor community contribution to reconstruct stations; and
- Donor community support for new, higher capacity stations.

FORECAST AND EARLY WARNING SYSTEMS

RECONSTRUCT AND IMPROVE FLOOD WARNING SYSTEMS

Measure of Progress:

- The number of ALERT networks that are installed and made operational, and;
- Successful integration of the ALERT networks with measurement systems installed by other USG agencies or donors.

Measures of Effectiveness:

- Improvement in flood warning lead times and successful evacuations of people and protection of property;
- The incorporation of ALERT systems into national emergency preparedness and response procedures and decisions; and
- The ability of local and national institutions to maintain ALERT systems without direct U.S. government support.

ESTABLISH FLOOD FORECASTING SYSTEMS

Measures of Progress:

- The successful implementation and integration of the NWSRFS for critical and vulnerable river basin(s).

Measures of Effectiveness:

- The incorporation of NWSRFS into national institutions' procedures and decisions;
- The ability of local and national institutions to maintain NWSRFS without direct U.S. government support; and
- Improvement in flood warning lead times and successful evacuations of people and protection of property.

ESTABLISH REGIONAL SEASONAL CLIMATE PREDICTION SYSTEM

Measures of Progress:

- The development of a Regional Seasonal Climate Prediction System;
- The successful implementation of the System; and
- Completion of training workshops in climate forecasting and risk management.

Measures of Effectiveness:

- The incorporation of climate information generated by the Regional Seasonal Climate Prediction System into the procedures and decisions of national and local institutions; and

- The ability of the region to maintain the System.

DISASTER PREPAREDNESS AND RESPONSE

STRENGTHEN FORECAST, WARNING, PREPAREDNESS, AND RESPONSE INSTITUTIONS

Measures of Progress:

- Training courses held; and

- Linkages to other U.S. government training and capacity building activities;

Measures of Effectiveness:

- The improvement in the capabilities of national meteorological, hydrological, and emergency preparedness and response institutions;

- The ability of national institutions to sustain and expand their improved capabilities; and

- The extent to which national institutions assume leadership roles for meteorological, hydrological, and emergency preparedness and response issues.

HAZMAT SPILL PREVENTION AND RESPONSE

Measures of Progress:

- The identification of hazards to the public or environment from releases from fixed facilities, both existing as a result of Hurricane Mitch and potential from future natural disasters;

- New information provided to local and regional decision-makers about the sensitivity of coastal resources to hazardous materials releases; and

- Training courses which improve local capacity to respond to spills of oil or other hazardous materials.

Measures of Effectiveness:

- The development of new plans or protocols outside of pilot areas for responding to releases following severe storm events or other natural disasters;
- The implementation of special measures to protect sensitive resource areas from spills and discharges;
- The incorporation into new port and regional plans measures that protect coastal resources from releases of hazardous materials; and
- The establishment in port areas of requirements for contingency planning, spill prevention, and response training for vessels.

DEVELOP AN APPROACH FOR A REGIONAL CENTER FOR DISASTER REDUCTION

Measures of Progress:

- The development of the concept of a Regional Center for Disaster Reduction; and
- The co-location of regional forecasting and training functions in one location.

Measures of Effectiveness:

- The extent of international donor community and national support for the Center; and
- The eventual establishment of the Center.

RESERVOIR DECISION SUPPORT SYSTEM

Measures of Progress:

- The development of a decision support guidelines framework.

Measures of Effectiveness:

- The capability of the Dominican Republic to develop decision support guidelines.

SUSTAINABLE, RESILIENT COASTAL COMMUNITIES

SUPPORT FOR SUSTAINABLE USES OF GULF OF FONSECA RESOURCES

Measures of Progress:

- The development of an integrated DOC-USGS research and monitoring plan;
- Establishing a monitoring program for contaminants;
- Implementing an initial monitoring program for contaminants;
- Dissemination of initial monitoring program results to industry, NGOs, and government agencies;
- Transfer monitoring program to industry, NGOs, and other local implementers; and
- Transfer of DOC resources to initiate the Gulf of Fonseca management and protection plan.

Measures of Effectiveness:

- The active involvement of the aquaculture industry in the monitoring program;
- Identification of sources of contamination using monitoring program results; and
- The adoption of new best management practices to minimize mobilization of contaminants.

LONG-TERM WEATHER TRENDS ANALYSIS FOR HAZARDS MITIGATION

Measures of Progress:

- An analysis of long-term trends; and
- The system and dissemination mechanism for the development of ongoing analysis.

Measures of Effectiveness:

- The incorporation of long-term trends analysis into local preparedness and response decisions; and

- The incorporation of long-term trend information into local risk identification and mitigation programs.

RESILIENT BUILDING CODES AND CONSTRUCTION PRACTICES

Measures of Progress:

- The development of new, resilient building codes that are appropriate for Central America; and
- The development of model construction practices for disaster-resilient construction.

Measure of Effectiveness:

- The adoption by appropriate authorities of model codes and practices.

MARKET INCENTIVES FOR RESILIENT CONSTRUCTION

Measure of Progress:

- The development of an approach for market incentives for disaster-resilient construction and appropriate land uses.

Measure of Effectiveness:

- A viable business market for products and instruments that encourage siting and land use decisions to reduce exposure to coastal hazards and to encourage disaster-resilient construction.

LOCAL CAPACITY BUILDING AND SUPPORT NETWORK

Measures of Progress:

- The development of a program plan;
- Training for extension agents; and
- The placement of extension agents in the field.

Measures of Effectiveness:

- The delivery and use of DOC products and services delivered at the local level;

- The delivery and use of products and services provided by other U.S. government agencies;

- The expansion of the network using local and international donor community resources; and

The ability of the network to sustain itself after the U.S. government's reconstruction work has ended.

ECONOMIC REVITALIZATION

Measure of Progress:

- The convening of trade forums;

- Well-attended conferences on trade corridors and disaster minimization.

Measures of Effectiveness:

- Increased business contacts between Central American and U.S. companies;

- The implementation by Central American governments of transparency initiatives and the enhancement of these initiatives over time;

- Increased investment in Central America; and

- Road, rail, and port planning that incorporates disaster management concepts.

VI. COORDINATION OF ACTIVITIES

DOC will make every effort to ensure that its activities are coordinated with those of other donor programs, USAID's field missions, and other U.S. government agencies. To facilitate this coordination, DOC/NOAA currently has liaisons who work part-time with the World Bank's newly created Disaster Management Team and USAID's Water Team. These individuals spend nearly one-half their time with these organizations coordinating activities involving DOC. The Department also has regular discussions with the Inter-American Development Bank regarding water resources management and flood forecasting activities. These discussions will continue once DOC's reconstruction work in Central America is underway. As discussed in Section VIII below, program managers will coordinate proposed and ongoing activities on a regular basis with the respective USAID missions, USAID's Regional Program, and other offices, such as USAID's Office of Foreign Disaster Assistance.

In addition, DOC has and will continue to coordinate activities with other U.S. government agencies through US AID and with the agencies directly themselves. DOC initiated the formation of an informal Interagency International Water Resources Management group which meets quarterly or more frequently as required to discuss water-related projects, many of which involve flood forecasting and mitigation. In addition to representatives from DOC/NOAA, members of this group include representatives from the USGS, DOD/ACOE, FEMA, TVA and DOI/BOR. Representatives from US AID and donor organizations also attend when appropriate. These meetings will continue to provide a forum for the exchange of information on Central American activities. For example, DOC/NOAA will coordinate efforts to design its proposed flood forecasting and early warning systems (e.g., ALERT networks) and DCP refurbishment (see Section IV above) with USGS since USGS's proposed program also involves the installation of streamflow gages.

DOC will coordinate activities with international organizations, such as the United Nations' World Meteorological Organization (WMO) and the Organization of American States (OAS). The WMO's Tropical Cyclone Programme for Region IV, covering North and Central America, coordinates cooperative efforts among countries in preparing for and issuing forecasts and warnings for all tropical cyclones affecting the region. OAS, in coordination with the World Bank, may be sponsoring installation of ALERT-type networks in some of the affected countries.

A number of DOC projects depend on data collected by other U.S. government agencies and on close working relationships with many of the organizations and agencies involved in post-Mitch reconstruction. A number of DOC's projects would be enhanced by linking them with activities proposed by other U.S. government agencies, notably the USGS, FEMA, and USACE. DOC is currently expanding existing relationships to take full advantage of such opportunities. As project implementation proceeds, DOC expects to identify other opportunities for collaboration.

VIII. MANAGEMENT PLAN

OVERVIEW

High-level oversight of the Department's activities will be provided by two Program Directors, who will, among other things, direct DOC's work in the region, represent the Department at Administration and other high-level meetings, and make all final budgetary and other decisions that significantly and substantially affect the nature of DOC's proposed work.

Because several bureaus (ITA, NIST, and NOAA) are involved in DOC's proposed work, one Program Manager will be directly responsible for coordinating all of the Department's work and will report to the Program Directors. The Program Manager will oversee DOC's technical and administrative activities and will assist the Program Directors as a point person for interactions with other U.S. government agencies, USAID, donor and international organizations, and local and national officials of the affected countries. In addition, the Program Manager will keep USAID missions apprised of progress and will relate problems or concerns to the missions as needed.

Each bureau within the Department will have an Agency Program Manager who will report to and work directly with the Program Manager. Agency Program Managers will be responsible for closely monitoring all administrative and budgetary requirements of their agency's activities, including the reporting and other requirements of DOC's Interagency Agreement with USAID. In addition, Agency Program Managers will be responsible for timely providing to the Program Manager country and regional work plans and information regarding their agency's activities for inclusion in DOC's quarterly progress report to USAID, as required by the Interagency Agreement.

Each DOC agency may use FTE and/or contractors, as appropriate, to perform the tasks outlined in Section IV. Each bureau will be responsible for procuring and managing required contractor support. Because of the urgency in fulfilling some immediate needs, agencies may choose to use existing contractors. DOC managers, however, will provide all technical and administrative oversight and direction for work performed by contractors.

SCHEDULE

DOC is prepared to begin work on all tasks outlined in Section IV once the appropriate funding is made available. Since these tasks are divided among several bureaus within the Department, there is little conflict of resources. All proposed tasks will be implemented within the required two-year time frame. Recommendations for programs that are likely to continue beyond the two-year time period will be made. Installation of the ALERT systems will be accomplished on a priority basis

negotiated with the countries and the U.S. AID missions. A schedule summary follows on the next page.

Commerce Task Summary	3rd Qtr. FY 1999	4th Qtr. FY 1999	1st Qtr. FY 2000	2nd Qtr. FY 2000	3rd Qtr. FY 2000	4th Qtr. FY 2000	1st Qtr. FY 2001	2nd Qtr. FY 2001	3rd Qtr. FY 2001
BASE INFRASTRUCTURE RECONSTRUCTION									
Reconstruct and Improve Geodetic Networks									
Reconstruct and Improve Met Data Collection Networks									
Reconstruct and Improve Tide Gauge Networks									
Develop Satellite Data Receiving, Processing, and Analysis Capability									
FORECAST AND EARLY WARNING SYSTEMS									
Develop National Strategic Implementation Plans									
Reconstruct and Improve Flood Warning Networks									
Establish Flood Forecast System									
Develop Regional Seasonal Climate Prediction System									
DISASTER PREPAREDNESS AND RESPONSE									
Strengthen Forecasting, Warning, Preparedness, and Response Institutions									
Improve HAZMAT Spill Prevention and Response									
Develop an Approach for a Regional Center for Disaster Reduction									
SUSTAINABLE, RESILIENT COASTAL COMMUNITIES									

Supporting Sustainable Uses of Gulf of Fonseca Resources									
Long-Term Weather Trends Analysis for Hazards Mitigation									
Resilient Building Codes/Construction Practices									
Market Incentives for Resilient Construction									
Local Capacity Building and Support Network									
ECONOMIC REVITALIZATION									
Trade Development									